1 Form A Solid State Relay

FEATURES

- High speed SSR - t_{on}/t_{off} < 800 µs
- Maximum R_{ON} 0.25 Ω
- Isolation test voltage 5300 V_{RMS}
- Load voltage 60 V
- Load current 2 A DC configuration
- DIP-6 package
- Clean bounce free switching
- TTL/CMOS compatible input
- Available on tape and reel
- Pure tin leads
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3

RoHS COMPLIANT

DESCRIPTION

The VO14642AT are high speed SPST normally open (1 form A) solid-state relay in a DIP-6 package. The relays are constructed as a multi-chip hybrid device. Actuation control is via an infrared LED. The output switch is a combination of a photodiode array with MOSFET switches. The relays can be configured for AC/DC or DC only operation.

APPLICATIONS

- Instrumentation
- Industrial controls
- Security

AGENCY APPROVALS

UL1577: file no. E52744 system code H, double protection

cUL - UL1577: file no. E52744 system code H, double protection

Notes

- IEC 60747-5-2 (VDE 0884) capable, consult sales representative for details
- Agency approvals are valid only for ambient temperature range - 40 °C to 85 °C

ORDERING INFORMATION

V	O	1	4	6	4	2	A	x	x	T	R
PART NUMBER							ELECTR. VARIATION	PACKAGE CONFIG.		TAPE AND REEL	

PACKAGE	UL, cUL
SMD-6, tape and reel	VO14642AABTR
DIP-6, Tubes	VO14642AT

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ABSOLUTE MAXIMUM RATINGS [1] (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
LED continous forward current		I_F	50	mA
LED reverse voltage		V_R	5	V
LED power dissipation	at 25 °C	P_{diss}	80	mW
OUTPUT				
DC or peak AC load voltage		V_L	60	V
Load current (DC only)		I_L	2	A
Peak load current (AC/DC)	t = 10 ms	I_{LPK}	3.6	A
Output power dissipation	at 25 °C	P_{diss}	250	mW
SSR				
Total power dissipation		P_{diss}	330	mW
Ambient temperature range		T_{amb}	- 55 to + 85	°C
Storage temperature range		T_{stg}	- 55 to + 125	°C
Soldering temperature [2]	t ≤ 10 s max.	T_{sld}	260	°C
Isolation test voltage	for 1 s	V_{ISO}	5300	V_{RMS}

Notes

(1) Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.

(2) Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).

ABSOLUTE MAXIMUM RATING CURVE

Fig. 1 - Load Current (AC/DC) vs. Temperature

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THERMAL CHARACTERISTICS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Maximum LED junction temperature	at 25 °C	$T_{jmax.}$	125	°C
Maximum output die junction temperature	at 25 °C	$T_{jmax.}$	125	°C
Thermal resistance, junction emitter to board	at 25 °C	θ_{EB}	176	°C/W
Thermal resistance, junction emitter to case	at 25 °C	θ_{EC}	208	°C/W
Thermal resistance, junction detector to board	at 25 °C	θ_{DB}	67	°C/W
Thermal resistance, junction detector to case	at 25 °C	θ_{DC}	134	°C/W
Thermal resistance, junction emitter to junction detector	at 25 °C	θ_{ED}	310	°C/W
Thermal resistance, case to ambient	at 25 °C	θ_{CA}	2180	°C/W

Note

- The thermal model is represented in the thermal network below. Each resistance value given in this model can be used to calculate the temperatures at each node for a given operating condition. The thermal resistance from board to ambient will be dependent on the type of PCB, layout and thickness of copper traces. For a detailed explanation of the thermal model, please reference Vishay's thermal characteristics of optocouplers application note.

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
LED forward current, switch turn-on	I_L = 1 A, $V_L \leq$ 0.5 V, t = 10 ms	I_{Fon}		0.5	2	mA
LED forward current, switch turn-off	V_L = 60 V, I_L < 1 µA	I_{Foff}	50			µA
LED reverse current	V_R = 5 V	I_R			10	µA
LED forward voltage	I_F = 10 mA	V_F	1	1.3	1.5	V
OUTPUT						
On-resistance (AC/DC)	I_F = 10 mA, I_L = 1 A	R_{ON}		0.18	0.25	Ω
On-resistance (DC only)	I_F = 10 mA, I_L = 2 A	R_{ON}		0.05	0.07	Ω
Off-state leakage current	I_F = 0 mA, V_L = 60 V	I_{LEAK}			1	µA

Note

- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluations. Typical values are for information only and are not part of the testing requirements.

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PIN CONFIGURATION

SWITCHING CHARACTERISTICS (AC/DC CONNECTION)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time	I_F = 10 mA, V_L = 30 V, I_L = 200 mA	t_{on}		370	800	µs
Turn-off time	I_F = 10 mA, V_L = 30 V, I_L = 200 mA	t_{off}		50	800	µs
Turn-on time	I_F = 10 mA, V_L = 5 V, I_L = 1 A	t_{on}		550		µs
Turn-off time	I_F = 10 mA, V_L = 5 V, I_L = 1 A	t_{off}		18		µs

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SAFETY AND INSULATION RATINGS							
PARAMETER		TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Climatic classification		IEC 68 part 1			40/85/21		
Pollution degree		DIN VDE 0109			2		
Tracking resistance (comparative tracking index)		Insulation group IIIa	CTI	175			
Highest allowable overvoltage		Transient overvoltage	V_{IOTM}	8000			V_{peak}
Maximum working insulation voltage		Recurring peak voltage	V_{IORM}	890			V_{peak}
Insulation resistance at 25 °C		V_{IO} = 500 V	R_{IS}			$\geq 10^{12}$	Ω
Insulation resistance at T_S		V_{IO} = 500 V	R_{IS}			$\geq 10^{9}$	Ω
Insulation resistance at 100 °C		V_{IO} = 500 V	R_{IS}			$\geq 10^{11}$	Ω
Partial discharge test voltage		Method b, $V_{pd} = V_{IORM}$ x 1.875	V_{pd}			1669	V_{peak}
Isolation test voltage		1 s	V_{ISO}			5300	V_{RMS}
Safety limiting values - maximum values allowed in the event of a failure	Case temperature		T_{SI}		165		°C
	Input current		I_{SI}		150		mA
	Output power		P_{SO}		400		mW
Minimum external air gap (clearance distance)		Measured from input terminals to output terminals, shortest distance through air			≥ 7		mm
Minimum external tracking (creepage distance)		Measured from input terminals to output terminals, shortest distance path along body			≥ 7		mm

Note

- This SSR is suitable for “safe electrical insulation” only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

Fig. 2 - LED Forward Voltage vs. Current

Fig. 3 - LED Leakage Current vs. Temperature

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Fig. 4 - Output Leakage Current vs. Temperature

Fig. 7 - LED Current for Switch Turn-on vs. Temperature

Fig. 5 - LED Voltage vs. Temperature

Fig. 8 - On-resistance vs. Temperature

Fig. 6 - Diode Breakdown Voltage vs. Temperatur

Fig. 9 - Turn-off Time vs. Temperature

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Fig. 10 - Turn-off Time vs. LED

Fig. 13 - Load Current vs. Load Voltage

Fig. 11 - Turn-on Time vs. Temperature

Fig. 14 - Switch Capacitance vs. Applied Voltage

Fig. 12 - Turn-on Time vs. LED

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PACKAGE DIMENSIONS in millimeters

PACKAGE MARKING

Note

- Tape and reel suffix (TR) is not part of the package marking.

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